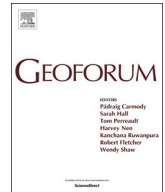




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From flooded fields to a vanished lake: The politics of broken water cycles in the Bolivian Altiplano

Clayton Whitt

Department of Anthropology, University of British Columbia, 6303 NW Marine Drive, Vancouver, BC V6T 1Z1, Canada

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ABSTRACT

In the floodplains of Bolivia's western highlands, or *Altiplano*, farmers, herders, and fishers maintain their livelihoods at water-land interfaces that are riddled with disaster risk. This paper draws on 13 months of fieldwork in the region as well as contemporary press accounts to explore water-land disasters in the Desaguadero River floodplain and Lake Poopó watershed. My analysis builds on Henri Lefebvre's notion of rhythm to articulate a "politics of cyclic dissonance" – struggles and negotiations surrounding cyclical relationships like rainfall and annual flooding that break apart and leave dangerous consequences in their wake. I analyze two recent cases in Bolivia related to climate change taken from opposite extremes of the water cycle. The first case is the drying of Lake Poopó in 2015, an event that garnered headlines around the world as a representation of a drastic impact from climate change. The second case is the struggle of farmers in a community in the Lake Poopó watershed to manage flood irrigation in their canal systems without becoming victims of flooding themselves. Both cases illustrate how managing cyclic dissonance is a matter of negotiation, both between people representing different communities, between political constituencies and political leaders, and even between people and the environment, but such politics also works to obscure solutions to environmental problems that emerge from de-synchronized cycles.

1. Introduction

On December 12th, 2015, *La Patria*, the local newspaper in Oruro, capital of Oruro Department in Bolivia's central Andean highlands, greeted readers with an alarming banner headline: "Lake Poopó Disappeared." The accompanying article reported that Bolivia's second largest body of water, located 60 km south of the city on the 3750-meter high Altiplano, or high plain, had almost completely dried up, leaving in its place nothing but "an immense saline desert" (*La Patria*, 2015e). The article was accompanied by dramatic photos of land where there should have been water and desiccated corpses of water birds where there should have been life. This initial coverage led a wave of domestic and international media attention to Lake Poopó. While climate change was a major theme of local coverage, in the months that followed, *La Patria* and other Bolivian media outlets looked into other causes for the disaster, pointing toward problems such as water diversions for irrigation projects in Peru (*La Patria*, 2015h), mismanagement and theft of funds from a watershed restoration project (Página Siete, 2016; *La Patria*, 2015i), and mining impacts such as water pollution and water resource depletion (*La Patria*, 2015j; Página Siete, 2015a). Bolivian media therefore framed the disappearance of the lake in relation to ongoing local and national debates about resource

management, pollution, and environmental governance. In contrast, international coverage from outlets such as *The New York Times* and *The Guardian* mostly focused on the role of climate change. As *The Guardian*'s headline on the Associated Press's widely distributed article from January 22nd, 2016, stated, Lake Poopó was "lost to climate change" (Valdez, 2016). The *New York Times* included a report on the drying of Lake Poopó in an article series on climate change impacts around the world entitled "Carbon's Casualties" (Casey, 2016).

These press reports initiated a broader debate in Bolivia over why the lake disappeared, who was responsible, and what the government could have done to prevent it. The debate was shot through with what I call the politics of cyclic dissonance, the struggles and negotiations surrounding cyclical relationships with rainfall and annual flooding that can leave dangerous consequences in their wake when they break apart, or desynchronize, with other political, agricultural, and environmental cycles. This politics is emergent in the close relationships between water, land, and people in the Desaguadero River floodplain and Lake Poopó watershed. This region is crisscrossed with irrigation canals and beset with alternating cycles of intense floods and droughts that belie any separation of land and water into two distinct bodies. Kuntala Lahiri-Dutt discusses "hybrid water/lands," such as floodplains, as places that "are not only coproduced by nature and culture, but

E-mail address: c.whitt@alumni.ubc.ca.

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constitute a blend of water and land where the two are merged with each other imperceptibly and changeably” (2014, p. 507). The Desaguadero floodplain and area around Lake Poopó are therefore best characterized as such a hybrid water-land interface, a blending that transcends a simplistic “water-land dichotomy” (Lahiri-Dutt, 2014, p. 507). Conceptualizing this area as a water-land interface emphasizes the co-production of space through the intersecting trajectories and physical properties of land and water.

Every year the water-land interface of the Desaguadero floodplain and Lake Poopó basin undergoes cyclic fluctuations in water levels. In the winter much of the land is dry, as water remains contained in river channels, irrigation canals, and the lake. In the summer the river rises, the lake expands, and canals spill over their banks, both intentionally through flood irrigation and unintentionally when water flows out of control. Dry areas become marshland, roads become soft and at times impassable, and grazing livestock sink in mud to their knees. These events pose great inconveniences, or worse, for local residents, yet agricultural prosperity in the floodplain is dependent upon this cyclic mixture of water and land and the shift in balance between the two over the course of the year. Seasonal floodwaters refresh the soil with sediment and provide irrigation for crops and drinking water for livestock, while the dry season opens up grazing space on the marshlands and leaves fields available for plowing, planting, and harvesting. Floods and droughts are not so much exceptional events as extreme ends of the annual water-land cycles that underlay the productivity of the floodplain. When there is dissonance, or disharmony, between cycles – when farmers find their fields dry when it is time to plant, or flooded when it is time to harvest – their attempts to manage and mitigate the damage caused by exceptional environmental fluctuations enmesh in the region’s politics. In the Altiplano today, this politics is inextricably bound up with cycles of climate change, water pollution, and other human impacts that shape water-land cycles and are shaped in return by the politics of cycles that break apart, interfere with one another, and at times emerge as something new.

In this article I examine the emergence of an environmental politics of cyclic dissonance in relation to two cases from the Bolivian Altiplano. The first case is the ongoing debate over who or what was responsible for the drying of Lake Poopó. I explore this through press and NGO accounts of the disaster combined with experiences from my 13 months of fieldwork in the region in 2013 and 2014, which I carried out with Quechua-speaking herders and farmers in a municipality near the Desaguadero River and Lake Poopó called El Choro. The second case, also based on my 2013–2014 fieldwork, focuses on the opposite condition – water in dangerous overabundance – and explores the conflicts that arise between irrigators as they struggle to walk the thin line between flood irrigation and flood disaster. I argue that while floods and droughts represent seemingly opposed conditions, both cases illustrate how the politics of the water-land interface emerge in cyclic dissonance, when the cycles of water and how people manage it fall dangerously out of step with one another, resulting in disaster.

To think through cyclic dissonance, I draw from Henri Lefebvre’s conceptualization of rhythm, which for him is implicated in nearly all spatiotemporal processes. In his book *Rhythmanalysis* Lefebvre writes, “Everywhere where there is interaction between a place, a time and an expenditure of energy, there is rhythm” (2004, p. 25). Lefebvre distinguishes between two interrelated types of rhythm, cyclical and linear. Cyclical rhythms are often associated with what he calls the cosmic: planetary cycles like night and day, seasons, climates, and tides. He locates linear rhythm in social practice, denoted as the rhythm of monotony, work, and daily human activity, rhythms that he sees as associated with capital and its cycles of production and destruction (Lefebvre, 2004, p. 65). Lefebvre clarifies that separating rhythms into two general types does not mean that they act independently but rather that they “interfere with one another constantly” (2004, p. 18). The rhythms of El Choro’s water-land cycles, such as droughts or floods, are similarly not independent of one another. The relationships between

different linear and cyclical rhythms shape the experiences and politics of the water-land interface, including the efforts of political leaders, and the effects of different environmental processes, rhythms that originate with both the human and the non-human but are so thoroughly entwined as to be impossible to delineate as such (see Krause, 2013b). But for Lefebvre, there is another important bundle of rhythms to take into consideration: the body, which lies at the heart of his work on everyday life (Simonsen, 2005). The rhythms of the body provide the baseline for perception of all other rhythms, and the body is also the site where linear and cyclical rhythms meet and mix (Lefebvre and Régulier, 2004a, pp. 89–90). This resonates with Tim Ingold’s argument (2000) that an organism’s perception of the environment is inseparable from the constantly unfolding relations it shares with its surroundings, but Lefebvre goes farther, because through rhythm he designates the human body itself as a key site of politics. Rhythmic shifts in water-land cycles unfold across human, social, and environmental bodies and join them together. And as I argue in what follows, these shifts may be felt most acutely as political when they reach a state that Lefebvre designates as arrhythmia, when “rhythms break apart” (2004, p. 77).

What Lefebvre’s work on rhythm provides for my analysis is a focus on how environmental and sociopolitical processes mingle together in space and emerge inseparably over time in environmental, political, and bodily cycles that fluctuate constantly but at times become dangerously dissonant, or out of step with one another. What Lefebvre’s work on rhythm and arrhythmia lacks, however, is a sense of the political significance of the physical properties of material bodies themselves, like humans, water, land, and air, that share cyclic relationships and shape the politics that emerges in dissonance between cycles. As Paul Simpson notes, while Lefebvre did theorize embodiment – how the body is acted upon by and perceives different rhythms – he did not address the “material, fleshy, organic ‘stuff’ of the body itself” (Simpson, 2008, p. 815; see also Simonsen, 2005, p. 9). In other words, Lefebvre considered rhythmic relationships that manifest in space and time but not how such relationships are mediated through the physical capacities of different bodies, including the human body. Jane Bennett argues that the capacity of objects, including the human body, to “make things happen” shapes politics through material assemblages composed of both human and nonhuman (Bennett, 2010, p. 5). Or, in Bruno Latour’s terms, nonhumans and humans alike can be actants, sources of action that modify other entities (Latour, 2004, pp. 75, 237). If Lefebvre undertheorized material bodies, his incorporation of the nonhuman – such as environmental cycles – into the politics of rhythm resonates with Bennett’s and Latour’s discussions of how human and nonhuman bodies enter into political relationships that exceed human control. The purpose of this article, then, is to extend Lefebvre’s concept of rhythm by interrogating the political ramifications of cycles in the Lake Poopó watershed that reach a state of dissonance with each other, falling out of synchronization as they also manifest physical capacities that work at cross purposes to each other. Mixed into all of this are the actions of politicians and local irrigators as well as the influence of broader environmental processes, such as anthropogenic climate change, that have their own lineage of human and nonhuman actions, bodies, and cycles that bring them into being. From this mixture arise the politics of cyclic dissonance, but when a problem must be solved – farmers’ fields flood, or a body of water dries out – such politics can obscure solutions.

2. “Each drop of water is life”

The political importance of water in Bolivia is captured in the phrase “*agua es vida*” (water is life), which I frequently heard from my interlocutors in El Choro and is a common refrain across Bolivia. As Eduardo, my close research collaborator in El Choro, told me one morning in December 2013, after a night of heavy rain broke a long dry spell and soaked his quinoa fields, “Each drop of water is life, so millions of drops of water germinate millions of lives. We can live without electricity, look, we are doing so now (referring to a power outage), but

we cannot live without water. Water is life.” This phrase also served as a political rallying cry inextricably bound up with Bolivia’s recent history of water conflict. This conflict reached its height with the 2000 Cochabamba *Guerra del Agua*, or Water War, when residents of Cochabamba took to the streets and forced Hugo Banzer’s government to cancel the privatization of the municipality’s water supply, which had been driven in part by World Bank preconditions for debt relief (Hindery, 2013, pp. 59–60).¹ In the context of this conflict the use of the phrase *agua es vida* by protestors invoked water as inalienable commons and served as an anti-neoliberal battle cry: water is life, and it is too important to be privatized. The social movements built around the Water War, and the 2003 Gas War (a wave of national protests that drove President Gonzalo Sánchez de Lozada from power), helped set the stage for Evo Morales and his social movement-driven MAS-IPSP party to take power in 2005 (Harten, 2011). The political legacy of *agua es vida* is reflected in how Bolivia’s 2009 constitution (which in its preamble cites the Cochabamba Water War as one of the sources of inspiration for the Bolivian people to “construct a new state”) deals with water, including its establishment of a right to water for all (Constitución Política del Estado, 2009).²

“Water is life” also reflects the material underpinning for life in the water-land interface: El Choro’s web of irrigation canals and dense patchwork of plowed fields are built into the flat fertile floodplain soil, assembled by the intersection of living, moving water³ and malleable land and put to use by the farmers and herders who live there. As an elderly farmer named Mateo told me, “*El Creador* (the Creator) has provided us with this river here, and without this river, all of El Choro would be a desert, and we would never have been able to produce so much here.” However, while the water-land interface can be a site of agricultural prosperity, the intersection of water and land over time has important and potentially hazardous corollaries for the people of El Choro. For one, water does not simply run over the land but also mixes with it, suspends it, and transports it. Over the years water’s capacity to carry and deposit sediments enriches the soil for El Choro’s farmers, but as I will discuss, this same capacity also moves pollutants onto their lands and into local bodies of water, with disastrous consequences (see García et al., 2008; Niura et al., 2011; Quintanilla et al., 1995; Ramos Ramos et al., 2012). Furthermore, the rhythms and balances of the water-land interface are unstable. There is constant flux in the ways that land and water influence each other but are also influenced by other bodies of the environment (such as the atmosphere or the sun) and their mutual relationships with the actions of human actors (like mining companies, irrigators, or politicians) who pump and pollute and even change the climate over time. These different aspects of the water-land interface – fertility, intermixing, and instability – occur as water and land act upon each other over time. Physical capacities – such as for land to provide nutrients and a growth medium to crops and to provide physical space for channels to be carved and dams to be built, and for water to give life as well as to suspend and carry soil and contaminants – join together in what Doreen Massey (2005, p. 130) calls the “spatio-temporal events” of places, the dynamic and ever fluctuating meetings of trajectories in space that shift moment to moment yet lend continuity, and inscribe traces of history, over time.

¹ There is much literature discussing the Water War. Among others, see Assies, 2003; Dangel, 2007; Dwinell and Olivera, 2014; Fabricant and Hicks, 2013; Kohl and Farthing, 2006; Olivera, 2004; Perreault, 2006. For more on the role of World Bank preconditions in water privatization, see Shultz and Kruse, 2000.

² Despite the establishment of water as a constitutional right, Evo Morales’s MAS-IPSP government has yet to pass a water law implementing these sweeping constitutional reforms, leaving a long-outdated 1906 law on the books (Berton, 2015). Water, then, much like hydrocarbon development, mineral extraction, road building, and climate change, remains an ongoing tension between the rhetoric of the Morales Administration and its actions (see Aguirre and Cooper, 2010; Fabricant, 2012; Gustafson, 2013; Schilling-Vacaflor, 2013; Zimmerer, 2013).

³ For more on water as a living, vital substance, see Bunn, 2013; Krause, 2013a; Strang, 2013.

Climate change is threatening to further complicate water-land cycles in the Bolivian highlands. Observed data along with projections using general circulation models (GCMs) indicate that the rainy season in the Altiplano likely will shorten and intensify due to climate change (Seth et al., 2010). Net annual rainfall so far is not decreasing but rather falling in a shorter period of time (Seth et al., 2010; Thibeault et al., 2010). This limits rainfall availability over the length of the growing season while increasing flood risk during certain months. At the same time, temperature increases associated with climate change are raising the rate of evapotranspiration in the summer, leading to drier soil (Thibeault et al., 2010). In addition, overall drought risk is projected to increase in the highlands alongside temperature (Seiler et al., 2013). Climate change, then, is threatening to disrupt the water-land cycles upon which farmers depend each year. As the rainy seasons get shorter and more intense, and as the dry season gets longer and encroaches more on the growing season, the shift in balance between land and water upon which farmers depend will strain lives and livelihoods. Indeed, as the following cases show, such strain is already underway in El Choro.

3. “Lake Poopó Disappeared”

In the years leading up to the drying of the lake in 2015, many signs of cyclic dissonance were already well-known, making the death of Poopó a predictable event. As an editorial from the La Paz newspaper *Página Siete* stated, “Although it has caused great impact and alarm, the disappearance of Lake Poopó...was not unexpected news” (Página Siete, 2015b). One of the greatest causes of concern was the unmitigated waste from the Huanuni tin mines and other upstream mining complexes that flowed into the watershed and concentrated in the closed basin of Lake Poopó. As it flushed down the Desaguadero River, this mine waste mingled with other dangerous processes, including shifts in the water cycle associated with climate change and untreated sewage discharges into the watershed by the city of Oruro. This was reflected in comments I heard at a July 2014 meeting in El Choro between representatives of a La Paz-based NGO and local leaders. The purpose of the meeting was to identify points of concern and possible projects to include in a climate change adaptation plan for the region. Addressing the meeting, Senator Rosario Apaza Chambi, who represented El Choro in the national Senate in La Paz as a *senadora suplente* (alternate senator) for the MAS-IPSP party, addressed the changes in and around Lake Poopó that put the region at risk. An NGO representative asked for input on what needed to be done to prevent floods in El Choro, and the senator replied:

In truth, it is very worrying when we talk about climate change. It is of great concern in light of the fact that all of the water that we’re talking about in Uru Uru and Poopó is completely polluted. Lake Uru Uru is polluted by wastewater and Lake Poopó is polluted by mining operations. There is Comibol in Huanuni as well as the cooperative mines. Also the Chinese are building a new processing plant in Huanuni that is going to process 3000 tons (of tin) every day.⁴ Can you imagine? 3000 tons per day! Sadly, to this day there is no tailings pond (for Huanuni)...everything goes directly into the river. This is why some people say that the tailings pond is Lake Poopó. How many times have I protested in the meetings that we have

⁴ Senator Apaza was referring to a plant under construction in the mining city of Huanuni, about 50 km to the southeast of Oruro and 30 km east (and upstream from) El Choro. First announced in 2010 and planned to process 3000 tons of tin per day, the plant was being built by a Chinese company, Vicstar, at a cost of US\$50 million, and would be operated by the Bolivian state-owned Empresa Minera Huanuni (Huanuni Mining Company). The project suffered significant delays and was not online as of October 2017, in part due to lack of water supply (it needed 30,000 cubic meters per day) and tailings ponds, which had been mandated by the Ministry of the Environment but had not been completed as of November 2017. See La Patria, 2010; La Patria, 2011; La Patria, 2015c; La Patria, 2016a; La Patria, 2017c; ATB Digital, 2017.

had?...Livestock consume the water, and people drink the water too. It is a totally dangerous risk.

Senator Apaza's comments reflect on the dangers that converge in the body of the lake and are refracted into the bodies of the region's residents. With a new mineral processing plant under construction, Senator Apaza asserted that daily mine waste discharges would increase by a highly damaging degree, but despite her objections, the government was uninterested in taking action. Compounding the danger was the fact that the *de facto* tailings pond for the mines was the lake itself, where the uncontrolled waste discharges came to their final resting place and concentrated in the water under the powerful Altiplano sun. Her comments illustrate some of the consequences of water's physical capacity to erode and transport land: in this case the Desaguadero and its tributaries brought mine waste down from the mountains and filled Lake Poopó in with sediment, some of which was toxic. Polluted water, displaced land, and the fluctuations of climate change enter into an "antagonistic unity of relations" (Lefebvre, 2004, p. 18) with the cyclical rhythms of the lake, including the seasonality of rain, the cycle of evaporation, the annual waxing and waning of Lake Poopó's surface area, and the sedimentation and salinization that occur over time in the closed basin. These cycles amplified the effects of pollution (through concentration of contaminants) and climate change (by intensifying climate change-related shifts in the lake's volume). This cyclic dissonance intertwines with the needs of living bodies: the necessity for hydration of humans and livestock alike puts them at risk from pollution and changing cycles of precipitation that can make polluted water abundant (in floods) or scarce (in droughts). Senator Apaza's comments presaged the extreme event that was to come a year later with the headline-grabbing disappearance of nearly all of the lake's water. Before the late 2015 drying came to pass, however, Lake Poopó's death was to manifest in a different way.

In November 2014, shortly after I left Bolivia and still a year before headlines announcing the lake's disappearance, residents living close to the southwestern shores of Lake Poopó reported a mass die-off of wildlife. Early estimates were that millions of fish, as well as hundreds of birds, died and washed up on the shore on November 18th, leaving a band of dead animals over 30 km long and three meters wide (La Patria, 2014b). The investigation by Oruro's Servicio Departamental de Agricultura y Ganadería (Departmental Agricultural and Livestock Service, or SEDAG) blamed the die off on a convergence of causes that, in my view, illustrate how cycles sustaining life in the lake had broken apart (La Patria, 2014c; Mejía, 2014; Mollo Mollo, 2014). According to SEDAG's report, fish were already stressed due to rising water temperatures related to climate change, which lowered the dissolved oxygen content of lake waters. Then on November 18th there were high winds (up to 69 km per hour) that drove the fish to low-oxygenated waters close to shore, where they suffocated and washed up onto the beach *en masse*. SEDAG acknowledged that mine contaminants and the water's high salinity may have played a role, especially since birds also died, although they did not give details. The die off disrupted Lake Poopó's fishing communities and drove many fishers to migrate out of the area in search of work (La Patria, 2014a; La Patria, 2015d). On December 24th, just over a month after the die off, the Oruro-based environmental NGO known as the Coordinadora en Defensa de la Cuenca del Río Desaguadero, los Lagos Uru Uru y Poopó (Coordinator in Defense of the Desaguadero River, Lake Uru Uru, and Lake Poopó Watershed, or CORIDUP) issued a resolution condemning what they perceived as the inaction and apathy on the part of political leaders, including the governor of Oruro, who they asserted was downplaying the disaster. They called for a protest to pressure the government to investigate the root causes of the die-off and take action to protect and restore the lake.⁵ Several months after the disaster, CORIDUP and other

environmental organizations and agencies issued a joint call for mines to establish tailing ponds and for the government to enact a dredging project to improve water flow to the lake (La Patria, 2015a; La Patria, 2015b).

The lake was widely recognized as envenomed and moribund by the time it dried out at the end of 2015, about 12 months after the fish die off. Even so, many responses to the November 2015 drying, particularly from policymakers, emphasized the cycles that the lake had historically experienced in a way that mostly decoupled them from damaging processes, like water pollution and irrigation diversions, which had intersected with them. For his part, the governor of Oruro, Victor Hugo Vásquez of the MAS-IPSP party, acknowledged that climate change, sedimentation, and mine contamination played a role in damaging the lake, but he also emphasized the history of cycles that the lake had faced that had sometimes shifted the balance between water and land. Under the headline "Governor Not Worried that Lake Poopó has Gone Dry," the newspaper *La Patria* reported the governor's remarks on the crisis, delivered during a television interview, wherein he referred to his upbringing in the village of Orinoca, on the west side of the lake, and then said:

We shouldn't worry about the fact that the lake is drying out, because Lake Poopó has its cycle, it is like the rain, it is like the wind, the people know perfectly, there are years that it rains more, years that it rains less...there is this dynamic in the conduct of the rain in Bolivia, not only in Oruro but around the world.

La Patria (2015g)

The governor attempted to dispel concern over the lake by appealing to a depoliticized rendering of the lake's cycles: in essence, he asserted that there is no reason to worry if this is a cycle as natural as fluctuations in the wind and rain. The upshot of this argument is that no one should point their finger too much at the role of the government of Oruro. For his part, President Evo Morales also emphasized Lake Poopó's supposedly apolitical cycles of drying and filling. At a public event on December 20th, 2015, Morales (who also grew up near Orinoca) recounted that his father had crossed the dry lakebed on his bicycle as a young man. He said: "Some members of the opposition say that it is the fault of the Government that the water is drying out. What a lie if it always dried, but also it used to fill up. The people who live on these rivers and that lake are familiar with this situation" (La Patria, 2015k). Some local people echoed the perceptions of President Morales and Governor Vásquez about the lake; for example, an indigenous leader from the lakeside community of Untavi told *La Patria* that the lake had always followed cycles of filling and drying, although he also asserted that it had never vanished completely before (La Patria, 2015f). There were also local fishers who remembered a similar fish die off that happened between 1992 and 1994.⁶ The NASA Earth Observatory in the United States issued a pair of images (well-covered by the Bolivian media) showing comparisons of the lake's surface area between 2013 and 2015, demonstrating the loss of the lake, but they also noted that the lake dried in 1994 and needed several years to recover (Hansen and Allen, 2016).

Although President Morales and Governor Vásquez both acknowledged that climate change played a role in the drying of the lake, their emphasis on the role of supposedly natural and apolitical cycles in some ways echoed how climate change deniers in North America try to deflect human responsibility.⁷ But what such appeals miss is that, as Lefebvre argues, repetition creates difference over time, especially as

(footnote continued)

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⁵ Centro de Ecología y Pueblos Andinos's Facebook page, accessed May 13, 2016, https://www.facebook.com/permalink.php?story_fbid=678122332308825&id=119057281548669

⁷ See, for example, Bell, 2012; Easterbrook, 2008; Spencer, n.d.

⁵ Centro de Ecología y Pueblos Andinos's Facebook page, accessed May 13, 2016, https://www.facebook.com/permalink.php?story_fbid=690853747702350&id=119057281548669

different rhythms enter into “antagonistic unity” and interfere with each other (Lefebvre, 2004, pp. 16–18). Having a precedent for the lake drying and recovering did not mean that the 2015 event was separate from humans, nor did it indicate that the lake’s recovery was inevitable. Recovery would be difficult if mine pollution continued to flow into the lake. The lake’s cycles will not necessarily be the same every time. It might simply be too damaged to fully recover, especially in the absence of new government policies and projects like pollution mitigation and restoration of water flow into the Desaguadero River. Cyclic dissonance could be fatal in the water-land interface.

The uncertainty over the lake’s recovery was a concern for many environmental advocates, as well as some journalists and commentators, who pinpointed the cause of the crisis more in human actions and choices that had sundered the cycles sustaining the lake. The Oruro environmental NGO Centro de Ecología y Pueblos Andinos (Center for Ecology and Andean Peoples, or CEPA) posted a statement on Facebook blaming the drying on four processes that kept the lake from recharging: water diversions for irrigation and mining, the uncontrolled discharge of mine waste, soil erosion related to the expansion of quinoa monoculture, and climate change-related temperature increases.⁸ Other critics pointed to similar determinants.⁹ A debate also developed about the role of Programa Cuenca Poopó (Poopó Watershed Program), a governmental project established in 2010 under cooperation between the Department of Oruro and the European Union, which provided most of the funding. Critics, including Oruro’s former prefect from 2010, charged that Programa Cuenca Poopó “squandered” its €14 million budget and let the lake die, while the former director of the program argued that it never had enough money to save the lake (La Patria, 2015i; La Patria, 2015l). There were also charges that at least some of the program’s funds were lost to internal theft (Página Siete, 2016). Thus these internal dynamics of Programa Cuenca Poopó also influenced the cyclical dissonance that emerged in the lake.

Months after the drying, and a year and a half after the fish die off, communities bordering the remnants of the lake struggled to move forward. February 2016 brought heavy rains to the region, prompting the Ministerio de Medio Ambiente y Aguas (Ministry of Environment and Water) to declare that a “natural process of recovery” was underway (Cuevas, 2016). A reporter for the La Paz newspaper *La Razón* wrote that the February rains left many lake residents hopeful that recovery had begun, enough that some who had left the area were already returning (Mejía, 2016). Even so, many of the residents of the communities on the west side of the lake migrated to Oruro and other cities to work in construction or sell artisanal wares or headed south to help with the quinoa harvest (La Patria, 2016e; La Patria, 2016f). The drying of the lake was the result of several years of shifting cycles, with more drying, and less renewal, year-to-year, finally culminating in the late 2015 event. Observers such as the former head of Oruro’s SEDAG (agricultural service) doubted that the lake would recover at all without a much larger government intervention (La Patria, 2016b).

The government of Oruro did put forward a restoration plan, including proposals for building treatment plants and tailings ponds for the mines, dredging the Desaguadero River, and constructing artificial ponds to restore fish populations (Pérez and Mejía, 2015). Several months after the disaster, in April, the government of Oruro also announced a plan to dredge the river channel between Lake Uru Uru and Lake Poopó (La Patria, 2016c; La Patria, 2016d), a project that was just over halfway complete by October 2017 (La Patria, 2017b). Whether or not these solutions bring water back to the lake in the short term, however, the lake may yet be moribund; the inevitable cycle of the endorheic lake is to fill with sediment and minerals until longer cycles

over time doom it to a more permanent death. Indeed, the Altiplano is the site of several such dried lakes, now salt flats, including the world famous tourist draw the Salar de Uyuni in the Department of Potosí. This highlights the instability of the water-land interface: with the Altiplano’s high intensity of droughts, sunlight, and sedimentation, sometimes land overtakes water for the long term. Whether or not that has already arrived for Lake Poopó, hastened by cyclic dissonance, is as yet uncertain. By the austral winter of 2017 the lakebed was mostly dry once again and covered by a layer of salt up to 20 cm thick in some places (La Patria, 2017a).

In 2015 pollution and drought threatened the livelihoods of dwellers at the water-land interface of the central Altiplano. Yet in previous years, water made its threats through the inverse product of cyclic dissonance: flooding. I now turn to the politics of flooding illustrated by El Choro’s irrigators and their struggles to use water for their fields and animals while attempting to protect themselves from its excesses.

4. Dry island, dry rivers, endless floods

Although exacerbated by climate change, flooding is a normal occurrence in the flat lands around the Desaguadero River. Some degree of flooding comes with every rainy season in non-drought years, as the river grows and canals spill over their banks. Portions of the landscape turn into marshes, and flamingoes displace cows that graze on aquatic reeds in drier times. Roads wash out and lands that are not completely flooded mix with rain and meld into mud, a viscous merger of soil and water. But while these annual flood cycles cause great inconvenience, they lie at the heart of the agricultural prosperity that arises in the water-land interface: the close pairing of fertile soil with readily available irrigation. To water their crops, farmers flood their fields. Oftentimes, when strolling along a muddy road, you can see fields under 15–20 cm of water from the irrigation canals, with a farmer nearby, shoes off and shovel in hand, controlling the water’s flow by breaching and plugging mud dikes and barriers.

However, the juxtaposition of agricultural fields with canals and the Desaguadero River makes the water-land interface vulnerable to heavy flooding. In the southern Desaguadero floodplain, the municipality of El Choro experienced disastrous flooding that drowned crops and affected thousands of people in 2010, 2011, 2012, and 2014. The awareness of flooding and its dangers is constant for local people. This was illustrated in an impromptu speech delivered by Eduardo on a windy winter afternoon in 2014. The occasion was a visit out to the countryside north of El Choro by a delegation from an NGO based in La Paz. A small community called Japo had recently completed a series of workshops to develop what the NGO called a “risk management plan” for so-called “natural” disasters related to climate change. The delegation had arrived to hear community members present the plan and celebrate its completion. Renato, the vice president of the community’s canal zone, presented the core components of the plan, much of which focused on flood protection through building higher dikes along the river, installing flood control gates in irrigation canals, and establishing an early flood alert system. Then it was Eduardo’s turn to speak. Years before he had been the community’s president, but on this day he spoke as a private citizen with a deep knowledge of the area. After speaking for a couple of minutes about the history of agricultural improvements in the area, Eduardo’s comments turned toward its propensity to flood:

Historically, all this land here was land covered by water. From that comes the name: in reality it isn’t “El Choro” but rather “El Churu,” which is a word in Aymara that means island. This area was a type of island, completely surrounded by water, and we see now that there are dry rivers that used to flow. So this is a zone that is very easy to flood... So when a lot of water comes down the river, the Mauri and the Desaguadero, and discharges here... Apart from this, there are the other rivers, the Poopó, and the Huanuni, which also

⁸ Centro de Ecología y Pueblos Andinos’s Facebook page, accessed May 13, 2016, https://www.facebook.com/permalink.php?story_fbid=907799916007731&id=119057281548669¬if_t=notify_me_page See also La Patria, 2015j.

⁹ See, for example, Chuquimia, 2015; Puente, 2016.

come down here. There is almost a constant danger here, in our home here, thinking that someday perhaps this area will be converted back into what it was before, everything a lake.

In these comments Eduardo weaves together the space-time of floods that happen in the past and spill into the future. He cites El Choro's situation at a convergence of rivers that feed the Poopó watershed as forming a geography of flood potential that threatens local residents. This potential also lives on in the history of the region as an island, a history Eduardo reads in traces such as the meaning of the name El Choro and the dry river beds that record an older, wetter time that could return. Eduardo's comments show how this convergence of rivers, and these traces of history and geography, produce the area as a water-land interface and evoke the threat of flooding, even on a dry August afternoon, leaving a constant fear that the lake will expand and make El Choro an island again. Eduardo's comments suggest that traces and memories of past water maintain a consequential presence even during dry times.

If we follow Doreen Massey in thinking about place as a spatio-temporal event, we see that the lingering traces of flooding described by Eduardo play a role in the production of El Choro as a place. Massey writes, "If space is rather a simultaneity of stories-so-far, then places are collections of those stories, articulations within the wider power-geometries of space" (2005, p. 130). These stories encompass the mingling of human and nonhuman in place. Massey writes, "The nonhuman has its trajectories also and the event of place demands, no less than with the human, a politics of negotiation" (2005, p. 160). Massey argues that each trajectory has its own temporality, or relationships with and over time, and it is the intersection of temporalities that make the history of a place, simultaneously producing it as unique yet always in flux: "It's the returns...and the very differentiation of temporalities that lend continuity. But the returns are always to a place that has moved on, the layers of our meeting intersecting and affecting each other; weaving a process of space-time" (Massey, 2005, p. 139). Massey helps to highlight, then, that in the water-land interface, water and land, always in flux, have interlocking histories that influence the cycles of the present. Past and future cycles shape the present: past water lives on in traces in the land and its potential as future water returning to flood the landscape once again.

The kind of flooding that Eduardo fears is only one of many trajectories weaving the spatiotemporal event of place, one of many stories collected there that co-exist and shape each other through processes of negotiation. But how do you negotiate with flooding? The people of El Choro know that the very infrastructure that undergirds their agricultural prosperity, a complex of irrigation canals, also make the region susceptible to flooding. Much of their negotiation with the floods comes in the form of managing this infrastructure, attempting to corral water and put it to use as it flows down the plain without letting it spill into damaging excess. The following case illustrates that when irrigators fail in their attempts at managing this water-land infrastructure, this can exacerbate flooding events and instigate political conflicts. But fool-proof flood prevention is also impossible, for water always holds the potential to escape human causes and controls. As Nigel Clark writes, reflecting on how anthropogenic climate change interacts with the long-term instability of the Earth's climate, "Whatever 'we' do...our planet is capable of taking us by surprise" (Clark, 2011, p. xi). With the intensification of the rainy season under climate change, extreme weather in the Altiplano bears the marks of anthropogenesis, and yet there is always something more to these floods as they run across the Desaguadero floodplain. No one is ever quite sure what will happen when the cycles of water and land meet.

The politics that emerges from flooding was evident in a work event that I attended in early January 2014. All irrigation beneficiaries in the southern parts of the municipality of El Choro were required to attend. Many farmers in the area depend on an intricate web of canals connected to the Desaguadero River, using the water for crops and

livestock. On this rainy summer morning, the called-for work was to dam the canal system at the point where it branched from the river, work that had to be done mostly by hand (with the aid of one excavator that arrived from Oruro) since floodgates installed a few years before had given way to the water. The work was urgent; heavy December rains had brought the river level up. The canal system, vital for watering during drier times, turned against the farmers, channeling floodwaters into their fields. The only way to prevent such flooding was by careful management and coordination, damming at just the right time, after there was enough rain for the crops but before flooding turned into a large problem. The cycles of water, plants, and irrigators had to be in alignment to avoid disaster.

During a pre-work meeting it became clear that this year the management of the canal system had broken down in the face of rising water levels, resulting in a state of cyclic dissonance that left some people flooded, vulnerable, and angry. This is what happened: throughout the municipality of El Choro, different portions of the canal system are divided into zones responsible for managing their own sections, with each zone having its own leadership structure and membership base. Each zone is supposed to report to one of the three central districts, which also have leadership structures and are intended to coordinate larger projects across the canal system, such as flood control. But that day in January I saw that this coordination sometimes failed. Exemplifying this, as the meeting began a canal zone president named Jeremias called for the floor and raised a topic that was to dominate the meeting, announcing, "We need to think of a punishment for those who have dammed their canals without coordinating with the other zones." He explained that for the third year in a row, some of the canal zones had dammed their sections without waiting for overall coordination of the work to dam the whole system. As a result, he said, some sections unilaterally protected themselves while raising water levels in the rest of the system and making flooding worse everywhere else. But some leaders from culpable zones defended their decision to dam their canals early. One president, a man in his mid-30s named Poncio, said, "We had people whose fields were flooded. We had to do something." Poncio did not see the decision to dam early as the main cause for flooding in downstream communities but rather portrayed his community as responding to cycles that had already broken apart: "There was no meeting where we could present our plan. There has been no effective coordination between zones. There was no general cleaning of the main canal this year, which makes the flooding even worse." While some participants agreed with Jeremias's call to punish such zones, many others agreed with Poncio, blaming the central canal district leaders for failing to act sooner and the municipal government for failing to carry out large-scale dredging projects the previous year. The meeting ended with no agreement on punishments, but leaders did sign an accord affirming that this would not happen again during future floods that were sure to come.

This dispute at the riverside illustrates some of the underlying political tensions of the water-land interface that are brought into sharp relief when water levels rise at a bad time for irrigators. The fear of this flooding reverberated through inter-community relations as unilateral canal damming protected some zones but made the flooding in others worse. Zone members demanded political action in response, including punishments, changes in leadership, and action by the municipal government. In this way the floods intertwined with patterns of poor leadership and larger disputes over the direction of the municipal government. But this also reflected the politics of negotiation between the human and the nonhuman that Doreen Massey argues lies at the center of the "throwntogetherness" of place (2005, p. 140). The politics of flooding are where the human and the nonhuman spill together into a complex negotiation that, in this case, resulted in a state of cyclic dissonance. Water's physical properties as a liquid and the gentle slope of the floodplain toward Lake Poopó shape this negotiation: the slope itself was political, enabling the flooding of some communities at the hands of others, facilitated by the dissonance between the cycles of

heavy rains, human-created infrastructure, and political decisions. Different sociopolitical trends in the countryside also shaped the changing patterns of flooding. One example is the depopulation of the countryside, which left fewer irrigators to do canal work, leaving canals unmaintained and, as Poncio pointed out, making the flooding worse. Another problem was that, as participants pointed out, municipal funds for flood control had gone unspent, reflective of the neglectful municipal governance that many people perceived as a broader problem for El Choro. But the floodwaters kept coming, overspilling attempts to contain them, even bursting through the concrete-and-metal flood control gate.

This kind of material power exhibited by the floodwaters is behind Jane Bennett's call to expand the notion of agency in order to de-privilege human intentionality, which she argues does not occur on its own but rather always emerges among a confederation of material bodies. The result of this is that for any event "the locus of political responsibility is a human-nonhuman assemblage" (Bennett, 2010, p. 36). This is increasingly salient in the era of climate change; as Bennett writes, "There was never a time when human agency was anything other than an interfolding network of humanity and nonhumanity; today this mingling has become harder to ignore" (2010, p. 31). Bennett's point is well-illustrated by how shifts related to climate change muddy any boundaries that could be traced between the excesses of the human and the nonhuman in the politics of flooding. This was evident in another meeting of irrigators that took place in March 2014, a couple of months after the January debate on the banks of the Desaguadero River. Having successfully dammed the irrigation system in January, the canals were dry, with irrigation provided by rainfall. The taken-for-granted dynamics of the rainy season was expressed in a saying that I heard repeatedly from *Choreños* in January: "*enero poco, febrero loco*," which translates as "January a little, February crazy." I took this to indicate the perception that no matter how much it rained in January, February would be rainier, delivering a "crazy" quantity that inevitably made January's rain look minimal. But in 2014 these patterns shifted: January produced a lot of rain, but in February it tapered off. By mid-March irrigators who had panicked about flooding met again to determine how quickly they could finish dredging the dry canals before releasing river water back into the system. The parched February had caught irrigators unprepared; the soil was drying out, and crops needed water. There was also a need to refresh and refill the *wigñas*, the watering holes for livestock, which suffered declines in water quality alongside volume, since pollutants concentrated as water evaporated. Lack of coordination by local irrigation leaders meant that water had to be released back into the canal system before all needed dredging had been completed, which could exacerbate flooding the following year. The cyclic dissonance of the 2014 growing season perpetuated itself.

These cases demonstrate that the temporality of flooding in the water-land interface spills between past, present, and future. The spatiotemporal event of flooding is not just a totalizing deluge of water washing over everything but a fabric of interwoven trajectories, including land, water, people, and politics, each having its own cycles that shapes the consequences and politics of the flood. As evidenced in Eduardo's speech, memories of past floods and physical traces of the landscape's watery past keep the threat of future floods alive. Brian Massumi argues that it is the nature of threat to always be open-ended. He writes, "Even if a clear and present danger materializes in the present, it is still not over. There is always the nagging potential of the next after being even worse, and of a still worse next again after that" (2010, p. 53). El Choro's flooding highlights the recursive temporality within which the cycles of disaster, place, and people affect each other in the water-land interface. This lens provides new glimpses into the political tensions that people negotiate with each other but also must negotiate with the nonhuman in myriad ways. But while future threats are open-ended, so are these negotiations.

5. Conclusion: cyclic dissonance

The water-land interface of the Bolivian highlands is fertile but vulnerable to disruption when cycles of water, land, people, and politics break apart. In this article I have built on Lefebvre's conceptualization of rhythms – the creation of difference through repetition, and the interference of linear and cyclic rhythms with each other – by extending it to a consideration of how material bodies alter each other and shape human action. In doing so I have intended to show how the environmental politics of the water-land interface emerge in large part when cycles that link together and act through different material bodies break apart, or desynchronize, a process I call cyclic dissonance. In these two cases I aimed to show how different cyclical processes – from rainfall to local canal management practices – influence each other and emerge in local politics that set the stage for solving, or failing to solve, environmental problems. For farmers living in the floodplain of the central Altiplano, managing this politics of cyclic dissonance means negotiating with the physical properties and cycles of water-land as well as with each other.

Looming over the two cases I have explored in this article is climate change. This may be the ultimate example of, in Lefebvre's terms, the interference of cyclical and linear rhythms with each other, as the appetites of capital lead to the discharge of greenhouse gases into the atmosphere, and this anthropogenic concentration of gases shifts the water cycle in highland Bolivia. In this way climate change attacks the relationships between water and land that underlay the agricultural prosperity of the Desaguadero floodplain and Poopó watershed. Focusing on certain determinants for the region's water problems, such as mine waste in the case of Lake Poopó, or communities that unilaterally dammed their canals in the case of flooding in El Choro, can help pinpoint culpable parties in particular cases. Yet focusing on climate change, such as President Morales and Governor Vásquez did in the early days of the Lake Poopó crisis, has a tendency to disperse and dilute responsibility locally and even nationally, complicating political mobilizations around these issues.

As the people of El Choro and the Lake Poopó watershed continue to struggle forward against droughts and floods, they will find that the inseparability of different types of water-land cycles will leave water problems difficult to solve. Many of El Choro's irrigators told me that their priority was an end to water pollution, which they said was held back by the political power of miners, who benefited from unlimited water use and minimal regulations (see Andreucci and Radhuber, 2014; Perreault, 2015). Even so, irrigators and environmental organizations made headway on this issue in recent years, and plans were underway in 2017 to build pollution containment infrastructure for the mines of Huanuni that discharge into the Poopó watershed. But could this all be for naught if climate change, whose solution lies far outside the hands of irrigators or even the Bolivian political system, shifts the cycles of land and water too far away from the needs of plants and people? Will the communities of El Choro dry up alongside the lake? These remain open questions, with answers subject to the constant negotiations that takes place in the water-land interface.

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